FACT SHEET FOR NPDES PERMIT NO. WA-002097-4

CITY OF LEAVENWORTH PUBLICLY-OWNED TREATMENT WORKS

SUMMARY

The City of Leavenworth is seeking reissuance of its NPDES permit for its publicly-owned treatment works (POTW). The POTW serves residential and commercial dischargers; there are no industrial dischargers to the system. In 1996, in response to actual and probable future violations of discharge effluent limits and occasional exceedances of design criteria, the City submitted a *Wastewater Facilities Plan* to the Department. The *Facilities Plan* contained a comprehensive assessment of the treatment plant and collection system, and concluded with a similarly comprehensive list of recommended corrective actions. Among the recommendations were a dramatically upgraded treatment plant and implementation of a comprehensive corrective and preventative maintenance program for the collection system. The upgraded wastewater treatment plant became partially operational in November 1999. Improvements to the collection system have begun and will continue in phases for the foreseeable future.

Improvements to the treatment plant include: an array of new equipment at the headworks to perform primary-level treatment of influent; expansion of activated sludge biological treatment processes, including a new aeration basin and anoxic selector tanks; a third secondary clarifier; an enhanced sludge handling system; ultraviolet (UV) disinfection; and a new outfall. In the event the presence of nutrients in the discharge were to become a concern, provisions were made for removal of phosphorus. In addition, the onsite wastewater laboratory was expanded and analysis equipment upgraded. As a result of the treatment plant upgrade the design population nearly doubled, from 2,020 to 3,849.

This permit requires the City to: comply with the established effluent limitations, routinely submit monitoring data of influent and effluent characteristics, submit assessments of treatment plant loadings, and infiltration and inflow for review. The current permit required development of an operation and maintenance (O&M) manual, which as of this writing has been submitted to the Department for review and approval.

On December 30, 2003 the Department issued a Consent Order # DE 03WQCR-5581 in which the City of Leavenworth was required to complete four activities by specific dates that includes (1) monitoring of Fats, Oils and Grease (FOG), (2) development of a FOG elimination program, (3) acquire additional operations staff to met staffing needs as identified in the O & M Manual and (4) submit a detailed Maintenance Program report. The Permittee is to document these activities through submittal of reports (a) a personnel report, (b) a maintenance progress report and (c) a series of FOG reports of which two reports remain to be completed during the proposed permit term.

The City has met all requirements of the order to date. The City has two more FOG elimination implementation reports due. One is due on or before February 15, 2005, prior to issuance of the proposed permit, and the final one will be due on or before February 15, 2006.

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INTRODUCTION

The Federal Clean Water Act (FCWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES permits), which is administered by the Environmental Protection Agency (EPA). The EPA has authorized the State of Washington to administer the NPDES permit program. Chapter 90.48 RCW defines the Department of Ecology's authority and obligations in administering the wastewater discharge permit program.

The regulations adopted by the State include procedures for issuing permits (Chapter 173-220 WAC), technical criteria for discharges from municipal wastewater treatment facilities (Chapter 173-221 WAC), water quality criteria for surface and ground waters (Chapters 173-201A and 200 WAC), and sediment management standards (Chapter 173-204 WAC). These regulations require that a permit be issued before discharge of wastewater to waters of the State is allowed. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-220-060) for issuing a permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the availability of the draft permit is required at least thirty days before the permit is issued (WAC 173-220-050). The fact sheet and draft permit are available for review (see Appendix A--Public Involvement of the fact sheet for more detail on the Public Notice procedures).

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in this review have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Comments and the resultant changes to the permit will be summarized in Appendix D--Response to Comments.

GENERAL INFORMATION	
Applicant	City of Leavenworth
Facility Name and Address	City of Leavenworth Publicly-Owned Treatment Works near Commercial and 14th Street Leavenworth, WA 98826
Type of Treatment	Activated sludge, oxidation/aeration, secondary clarification, ultraviolet (UV) disinfection
Discharge Location	Wenatchee River Latitude: 47° 12' 57" N Longitude: 120° 30' 21" W.
Water Body ID Number	WA-45-1010 (old) HM20EV (new)

BACKGROUND INFORMATION

DESCRIPTION OF THE FACILITY

The City of Leavenworth operates wastewater collection and treatment facilities serving residential and commercial customers within City limits of Leavenworth. Prior to 1994 the treatment plant had reached, and on occasion exceeded, its design capacity. In addition, the City determined that the treatment plant did not have the capability to meet receiving water standards for toxic constituents. Furthermore, the collection system was found to have several major deficiencies, with portions over 50 years old and reaching the end of their service life. Finally, significant population growth was projected over the next 20 years for the City, suggesting a further demand on wastewater services.

In response to the situation, the City executed an agreement with Varela & Associates, Inc. in September 1994 to prepare a *Wastewater Facilities Plan*, completed in April 1996. The plan recommended a comprehensive program of collection system rehabilitation and maintenance, including separation of storm sewers from the sanitary sewer system, and expansion and upgrade of the treatment plant, including an improved sludge management program, ultraviolet (UV) disinfection and enhanced treatment capacities. Improvements in the *Facilities Plan* were based on a 20 year planning horizon (1995 to 2015), when the service population is predicted to increase from 2020 to 4483.

Information contained in this fact sheet was derived from the final *Wastewater Facilities Plan, April 1996,* and the *Summary of Design, December 1997,* which contains 26 technical memoranda detailing improvements. Only the main points of the plan are detailed in this fact sheet; further information may be obtained by referring to the plan document itself. Specific sections, in Roman numerals, and pages, in Arabic numerals, of the plan are referenced in the fact sheet, as appropriate.

Some of the recommendations to rehabilitate and upgrade the collection system have been completed, but some elements of the program will continue indefinitely, so the collection system is described in relatively detailed terms in the following section. In contrast, the newly designed treatment plant is fundamentally different from the old plant and attained operational status before issuance of the current permit. Therefore, the Treatment Plant section of this fact sheet (p.6) only briefly describes the old facility and focuses on the new plant.

Collection System Status

The first sewer system was constructed in 1934 in the area between Front Street and the Wenatchee River. In 1947 the original combined storm and sanitary sewer system was completed for most of the remainder of the City. Between 1971 and 1973 a major project was undertaken to separate the storm water flows from the sanitary flows by constructing a separate storm sewer system. The storm water separation project included replacement of many sanitary sewer mains where the new storm sewers were placed below them, and resulted in a number of shared access manholes with separate flow channels for storm and sanitary sewage.

The original storm water separation project did not completely eliminate storm water inflow, nor provide all the separate storm sewers needed in the City. The project also had problems with the new storm and sanitary lines due to faulty construction. As a result, additional work on both systems continued, with additional projects to correct the worst problems, and to continue to separate the storm sewer system.

The sanitary sewer system consists of approximately 46,000 feet of gravity lines ranging in size from 6 to 18 inches. Most of the system consists of the original concrete pipe plus a large amount of asbestos cement pipe that was used to replace the concrete pipe during the storm water separation project. More recent sewer installations and extensions have been done using PVC pipe. The sanitary sewer system has essentially two main interceptor/trunk systems: one serving the north side of the City, and the other serving the south and west sides of the City.

The collection system is a gravity system except for lift stations at Bayern Village, Water Front Park, and Enchantment Park. All three stations are reportedly in satisfactory working order, except for normal operation and maintenance, and appear to have sufficient pumping capacity.

Deficiencies identified in the Facilities Plan include: sags in mains, suspected broken side sewers, sedimentation in mains, grease from restaurants, and tree root intrusions. Although the

problems are of concern, they have apparently not resulted in serious problems or extended interruptions in service within the collection system in recent years. There have been several manhole overflows due to blockage, which were quickly cleared. The City has signed a contract to implement a program of TV inspection of the system to identify areas of needed repair or replacement *(Facilities Plan, III-1,2)*. Inspections are conducted as time and circumstances allow.

Treatment Plant

Treatment of wastewater begins at the headworks, which consists of a mechanical grinder (Muffin Monster), grit removal and a rotating screen. Biological treatment begins with an anoxic process. An old oxidation ditch was partially converted into an anoxic conditioning tank, or selector, to improve sludge settling characteristics. The remainder of the ditch was made into an aerated sludge storage tank. After anoxic treatment, wastewater is conveyed to a newly-constructed oxidation ditch aeration basin. After aeration, wastewater undergoes secondary clarification, followed by ultraviolet disinfection and discharge to the receiving water.

Improvements to each of the treatment plant's major components, and some major operating parameters and design issues are briefly described below:

Headworks

A new headworks building was constructed and the following improvements were implemented during the previous permit term:

- Mechanically-cleaned bar rack installed.
- Comminutor replaced.
- Fine screening installed.
- Grit removal installed.
- Flow metering improved.
- Flow distribution improved.
- Automatic compositing sampler installed.

Selector/Sludge Storage Tanks

Oxidation ditch number 1 was demolished and the second existing oxidation ditch converted to utilize a portion of its volume as an anoxic conditioning tank, or selector, to improve sludge settling characteristics. The selector works by subjecting activated sludge to conditions that are detrimental to undesirable microorganisms (those that do not settle well or impede settling), and encourage the growth of well-settling microorganisms. The lack of free oxygen in the selector tank is the anoxic condition that selects for the desired microorganisms.

The remainder of the tank was converted into an aerated sludge storage tank. Coarse-bubble diffusers were installed to assure adequate mixing of tank contents and help prevent odor problems. Sludge is removed from the tank by pumping directly to the belt filter press.

A new oxidation ditch basin was constructed. The biological treatment system was designed to achieve complete nitrification throughout the year with relatively minor modifications.

Aeration Basin

Biological treatment of wastewater occurs in the aeration basin. The new aeration basin has a volume of approximately 750,000 gallons and is equipped with two variable-speed 50 hp aerators. The activated sludge system is designed to operate at a relatively low rate, with a solids retention time (SRT) of approximately 30 days in cold weather. The basin was designed for a relatively long SRT because minimum temperatures in Leavenworth's wastewater typically drop to 9º C, and at cold temperatures biological activity is slowed. The SRT of the basin is expected to result in at least partial nitrification of incoming ammonia.

The nitrification process consumes alkalinity, which in Leavenworth's wastewater is already low. Alkalinity will be controlled in the aeration basin either by changing the speed of the aerators to control dissolved oxygen concentration in the basin (and thus the nitrification rate), or by adjusting alkalinity in the basin by the addition of soda ash (or other chemical).

Secondary Clarifiers

The new plant utilizes two existing peripheral-fed, center weir, 32-foot diameter clarifiers. Component parts on these pre-existing clarifiers, and the associated sludge piping, were refurbished due to age and wear. Each clarifier contains a mechanism to plow settled sludge to the center of the tank, where it is removed for recycle to the aeration basin, or wasted to the sludge storage and dewatering facilities. A third clarifier was included as part of the upgrade because it was determined that the existing units would not provide adequate capacity for design loads. Each clarifier can be taken on or off line individually.

The new unit, Clarifier #3, operates in parallel with the other clarifiers. The new clarifier is a 40-foot diameter center feed, with a peripheral effluent weir and center sludge withdrawal. The design of the new unit allows for chemical addition for phosphorus removal, if necessary.

Disinfection

During the previous permit term, the City removed the chlorination disinfection system and installed an ultraviolet (UV) system. The system consists of 160 low pressure, low intensity, mercury vapor lamps, which provide radiation output of a wavelength that is most harmful to pathogens. Lamps are arrayed in four "banks" operated in series. Water surface level is

controlled by an automatic level control gate that maintains a nearly constant water level for all anticipated flows.

Outfall

As part of the upgrade, the City completely replaced its outfall pipe and diffuser. The fact sheet associated with the previous permit cited the outfall as deficient because it was not submerged during critical (low flow) receiving water conditions. The *Facilities Plan* had recommended extending the old outfall pipe, but subsequent investigation revealed this measure to be not feasible, due to the limited hydraulic capacity of the original pipe and the design of the outfall structure.

An additional issue for the outfall was that the treatment plant be able to discharge the design peak flow during river flood conditions. The UV disinfection building floor elevation was the controlling upstream element in evaluating required outfall pipe design. The main concern was that during a 100-year flood event the UV disinfection system not be "surcharged," or backed up, resulting in ineffective disinfection of the discharge. The new outfall is designed so that surcharging "will only occur when peak sewage flow and river flood crest coincide . . . when the river has significant dilution capability" (*Summary of Design*, Tech. Memo. TM16, p. 5).

The outfall consists of 16-inch ductile iron pipe culminating in a single-port diffuser. The end of the pipe is placed upstream of a large submerged boulder "for protection and to enhance conditions for fish habitat" (*Summary of Design*, Tech. Memo. TM16, p. 3). According to the permit application the discharge point into the Wenatchee River is approximately 69 feet from the shore and 15.24 feet below the stream surface during critical conditions. However, the 7Q10 depth of the river is reported at 3 feet, which is used in the dilution model.

Laboratory

The new laboratory building is an expansion of the old building.

Treatment Plant Classification

The new treatment plant is an activated sludge oxidation ditch design, which provides secondary treatment for the City's wastewater. The plant is classified as a Class 2 facility in accordance with the criteria contained in WAC 173-230-140. The classification is based on (1) the activated sludge process the plant utilizes as the primary treatment process and (2) the maximum average monthly design flow of less than 1 MGD. The principal treatment plant operator must be certified by the State as, at least, a Class II operator.

Residual Solids

The City has historically, and will continue to, dispose of its untreated sewage sludge at the Chelan and Douglas County Landfill when necessary. The city will continue, as it did in the spring and summer of 2004, to haul its biosolids to the Chelan County Composting Site during the months the facility is in operation. The City contracted with Varela & Associates, Inc and Esvelt Environmental Engineering to conduct a biosolids utilization study as part of the *Facilities Plan.* Phase 1 of the study examined a broad spectrum of alternatives to land filling the City's sludge. Alternatives were explored to treat sludge to either Class A or Class B biosolids.

The findings of the study and resulting recommendations are contained in *Biosolids Utilization*, Addendum No. 1 to the Facilities Plan, dated March 1999. The study concluded that the most cost-effective methods for utilization of treated biosolids were: Class A-containerized composting, and; Class B-air drying (*Biosolids Utilization, p. 6).* However, conclusion #3 states: "Both of the least cost alternatives . . . require significant capital and operating cost commitment on the part of the City." The Department will continue to work with the City and Chelan County to help them achieve more beneficial use of the biosolids through composting and less landfill disposal.

Class A biosolids are suitable for unrestricted use by the public, due to pathogen reduction and other pollutant-reducing measures taken during processing. Class B biosolids may contain detectable levels of pathogens and other pollutants, but do not pose a health threat. The use of Class B biosolids is subject to more stringent site restrictions pertaining to harvesting, crop type, grazing, and public access.

PERMIT STATUS

The current permit for this facility was issued on April 28, 2000. The current permit placed effluent limitations on 5-day Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), pH, Fecal Coliform bacteria, and Total Ammonia (as NH_3-N).

An application for permit renewal was received by the Department and accepted on September 22, 2004.

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

A compliance inspection without sampling was conducted on November 8, 2004.

The Permittee’s performance record during the course of the current permit is mixed. Although the Permittee has remained in compliance, based on Discharge Monitoring Reports (DMRs) submitted to the Department and inspections conducted by the Department, the City has

experienced 2 manhole overflows in 2004, two bulking incidents occurring in 2003 and one bulking incident and one spill which occurred in 2002.

The manhole overflows were caused by tree root intrusion at the sewer line joints in at least one of the incidents grease had exacerbated the problem. In all of the incidents, the sewer lines were jetted and the roots were sterilized. With the inception of the Leavenworth FOG elimination program, FOG caused problems are expected to diminish. The bulking incident of March 28, 2003 was caused by operator error brought on by a medical emergency at the plant. The March 2, 2003 was caused by a junior operator not following procedure, who was later terminated. The incident occurring on December 17, 2002 was caused by a combination of unexpected large flow with one clarifier out of service and a shortage of trained personnel. The spill was caused by a faulty check valve.

In all of the incidents the Department was notified as required and the Permittee has made good faith progress in addressing the root cause(s) of the problem. However, the Department believes the Permittee needs to address these problems in a more proactive fashion. To this end, the Permittee will be required, Special Condition S5.H., to develop an Collection System Addendum to the O & M Manual to specifically address scheduling of maintenance procedures.

WASTEWATER CHARACTERIZATION

Influent

Loadings to the POTW were reported in DMRs submitted to the Department and are compared with the applicable design criteria as follows:

Table 1: Influent Characterization

Parameter	July 2001 to September 2004 Characterization		Design Criteria
	Average	Highest Monthly Average	Monthly Average for the Maximum Month
Flow in MGD	0.321	0.575	0.84
BOD_5, in lbs/day	548.3	864.5	1390
BOD_5, in mg/L	199.6	285.9	NA
TSS, in lbs/day	678.8	1397.5	2110
TSS, in mg/L	240.5	495.5	NA

Effluent

The concentration of pollutants in the discharge was reported in the NPDES application and in DMRs. The effluent is characterized as follows:

Table 2: Effluent Characterization

Parameter	July 2001 to September 2004 Characterization			Existing Permit Limits	
	Average	Highest Monthly Average	Highest Weekly Average	Monthly Average	Weekly Average
Flow	0.362	0.452	0.68 [1]	0.84 [2]	Not Limited
Temperature in Celsius [1]	17	24	25 [3]		
BOD_5, in mg/L	3.7	7	17	30	45
BOD_5, in lbs/Day	9.6	22	56.4	210	315
TSS, in mg/L	5.8	17.6	28	30	45
TSS, in lbs/Day	17.5	47.7	82	210	315
Ammonia, in mg/L	0.5	1.2	4.0	15.5	
Ammonia, in lbs/Day	1.5	16.3	77	165	
Fecal Coliform Bacteria, in #colonies/100 mL	17.7	76	284	200	400

[1] Maximum daily flow
[2] Maximum monthly flow design criteria
[3] Based on critical season July through September

PROPOSED PERMIT LIMITATIONS

Federal and State regulations require that effluent limitations set forth in a NPDES permit must be either technology- or water quality-based. Technology-based limitations for municipal discharges are set by regulation (40 CFR 133, and Chapters 173-220 and 173-221 WAC). Water quality-based limitations are based upon compliance with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC) or the National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992.) The most stringent of these types of limits must be chosen for each of the parameters of concern. Each of these types of limits is described in more detail below.

The limits in this permit are based in part on information received in the application. The effluent constituents in the application were evaluated on a technology- and water quality-basis. The limits necessary to meet the rules and regulations of the State of Washington were determined and included in this permit. Ecology does not develop effluent limits for all pollutants that may be reported on the application as present in the effluent. Some pollutants are

not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation. Effluent limits are not always developed for pollutants that may be in the discharge but not reported as present in the application. In those circumstances the permit does not authorize discharge of the non-reported pollutants. Effluent discharge conditions may change from the conditions reported in the permit application. If significant changes occur in any constituent, as described in 40 CFR 122.42(a), the Permittee is required to notify the Department of Ecology. The Permittee may be in violation of the permit until the permit is modified to reflect additional discharge of pollutants.

DESIGN CRITERIA

In accordance with WAC 173-220-150 (1)(g), flows or waste loadings shall not exceed approved design criteria.

The design criteria for this treatment facility are taken from the Permittee's application for permit renewal and the City's approved 1996 *Wastewater Facilities Plan* engineering report prepared by Varela & Associates and are as follows:

Table 3: Design Standards for Leavenworth WWTP.

Parameter	Design Quantity
Monthly average flow (max. month)	0.84 MGD
BOD_5 influent loading	1390 lbs/day
TSS influent loading	2120 lbs/day
Design population equivalent	3,849

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

Municipal wastewater treatment plants are a category of discharger for which technology-based effluent limits have been promulgated by Federal and State regulations. These effluent limitations are given in the Code of Federal Regulations (CFR) 40 CFR Part 133 (Federal) and in Chapter 173-221 WAC (State). These regulations are performance standards that constitute all known available and reasonable methods of prevention, control, and treatment for municipal wastewater.

The following technology-based limits for pH, fecal coliform, BOD_5, and TSS are taken from Chapter 173-221 WAC are:

Table 4: Technology-based Limits.

Parameter	**Limit**
pH:	shall be within the range of 6 to 9 standard units.
Fecal Coliform Bacteria	Monthly Geometric Mean = 200 organisms/100 mL Weekly Geometric Mean = 400 organisms/100 mL
BOD_5 (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L
TSS (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L

The following technology-based limits for pH, Fecal Coliform Bacteria, BOD_5, and TSS were the most appropriate limits determined from: (1) WAC 173-220-130(3)(b); (2) WAC 173-221-030(11)(b); (3) WAC 173-221-040(1); (4) the recent *Facilities Plan* prepared by Varela & Associates, Inc., and (5) the Department's *Permit Writer's Manual*:

Parameter	**Limit**
pH:	Shall not be outside the range of 6.0 to 9.0 standard units.
Fecal Coliform Bacteria:	Monthly Geometric Mean Limit = 200 colonies/100 mL; and Weekly Geometric Mean Limit = 400 colonies/100 mL
BOD_5 and TSS:	Average Weekly Limit = 45 mg/L; and Average Monthly Limit is the most stringent of: a. 30 mg/L; or b. may not exceed fifteen percent (15%) of the average influent concentration.
Monthly BOD_5 and TSS effluent mass loading =	Average Monthly BOD Effluent Limit (30 mg/L) x Weight constant (8.34) x Maximum Month Design Flow (0.84 MGD) = 210 lbs/day
Weekly BOD_5 and TSS effluent mass loading =	1.5 x Monthly Effluent Mass Loading = 315 lbs/day

The BOD_5 and TSS effluent limits are the same limits as contained in the previous permit. The mass limits reflect an increase in the treatment capacity of the upgraded facility. Fecal coliform bacteria and pH limits remain unchanged from the previous permit.

SURFACE WATER QUALITY-BASED EFFLUENT LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters, WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established Surface Water Quality Standards. The Washington State Surface Water Quality Standards (Chapter 173-201A WAC) is a State regulation designed to protect the beneficial uses of the surface waters of the State.
In the absence of data indicating otherwise, the discharge is believed to have a relatively low adverse environmental impact potential and therefore, the permit does not have extensive effluent and receiving water data gathering and monitoring requirements. However, a preliminary evaluation of the discharge's potential for exceedance of the water quality standards for ammonia are made. Based on this preliminary evaluation, described in the following section, the discharger does not have a reasonable potential for exceedance of the water quality standards for ammonia.

In order to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters, WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established Surface Water Quality Standards. The Washington State Surface Water Quality Standards (Chapter 173-201A WAC) is a State regulation designed to protect the beneficial uses of the surface waters of the State. Water quality-based effluent limitations may be based on an individual waste load allocation (WLA) or on a WLA developed during a basin-wide total maximum daily loading study **(TMDL).**

Numerical Criteria for the Protection of Aquatic Life

"Numerical" water quality criteria are numerical values set forth in the State of Washington's Water Quality Standards for Surface Waters (Chapter 173-201A WAC). They specify the levels of pollutants allowed in a receiving water while remaining protective of aquatic life. Numerical criteria set forth in the Water Quality Standards are used along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limitations, they must be used in a permit.

Numerical Criteria for the Protection of Human Health

The State was issued 91 numeric water quality criteria for the protection of human health by the U.S. EPA (EPA 1992). These criteria are designed to protect humans from cancer and other

disease and are primarily applicable to fish and shellfish consumption and drinking water from surface waters.

Narrative Criteria

In addition to numerical criteria, "narrative" water quality criteria (WAC 173-201A-030) limit toxic, radioactive, or deleterious material concentrations below those which have the potential to adversely affect characteristic water uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health. Narrative criteria protect the specific beneficial uses of all fresh (WAC 173-201A-130) and marine (WAC 173-201A-140) waters in the State of Washington.

Antidegradation

The State of Washington's Antidegradation Policy requires that discharges into a receiving water shall not further degrade the existing water quality of the water body. In cases where the natural conditions of a receiving water are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Similarly, when receiving waters are of higher quality than the criteria assigned, the existing water quality shall be protected. More information on the State Antidegradation Policy can be obtained by referring to WAC 173-201A-070.

Critical Conditions

Determination of the reasonable potential for exceedance of the surface water quality standards are made for the waterbody's critical condition, which represents the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or characteristic water body uses.

Data collected by the US Geological Survey from 1930 to 1979 determines the critical low-flow (or 7Q10) of the receiving water at 379 cfs during the months of October and November. Data for the month of October were selected to calculate effluent limits for ammonia and determining the reasonable potential to exceed the water quality criteria because the most limiting ambient conditions and the highest effluent flows must be used to model a worst-case discharge scenario during critical flow conditions occurring July through September.

Table 5: Critical Conditions used in Dilution Modeling

Parameter	Value	Parameter	Value
7Q10 Flow	379 cfs	7 Q 10 Outfall Distance from Shore	69 feet
7Q10 Velocity	1.3 fps	Ambient Temperature	15.7 ºC [1]
7Q10 Depth	3 feet	pH	7.4 std. units
Manning Number	0.045	Dissolved Oxygen	8.7 mg/L [2]
Total Ammonia-N	0.01 mg/L [3]	Phosphorus	13.7 ug/L [4]
Alkalinity	18.5 mg/L [5]	Fecal Coliform	3.03 colonies/100mL [6]

[1] Department of Ecology Environmental Assessment Program (EAP) average value of 10 years from 1993 to 2003 during critical season
[2] Department of Ecology Environmental Assessment Program (EAP) lowest value in 10 years occurring August 1998
[3] EAP maximum in past 10 years
[4] EAP average of maximum months in past 10 years
[5] EAP average of maximum months in past 2 years
[6] EAP average of maximum months in past 10 years

Mixing Zones

The Water Quality Standards allow the Department of Ecology to authorize mixing zones around a point of discharge in establishing surface water quality-based effluent limits. Both "acute" and "chronic" mixing zones may be authorized for pollutants that can have a toxic effect on the aquatic environment near the point of discharge. The concentration of pollutants at the boundary of these mixing zones may not exceed the numerical criteria for that type of zone. Mixing zones can only be authorized for discharges that are receiving all known, available, and reasonable methods of prevention, control and treatment (AKART) and in accordance with other mixing zone requirements of WAC 173-201A-100.

The National Toxics Rule (EPA, 1992) allows the chronic mixing zone to be used to meet human health criteria.

Description of the Receiving Water

The facility discharges to the Wenatchee River which is designated as a Class A receiving water in the vicinity of the outfall. Characteristic uses include the following:

> Water supply (domestic, industrial, agricultural); stock watering; fish migration; fish rearing, spawning and harvesting; wildlife habitat; primary contact recreation; sport fishing; boating and aesthetic enjoyment; commerce and navigation.

Water quality of this class shall meet or exceed the requirements for all or substantially all uses. According to the 1998 303(d) list, this segment of the Wenatchee River, designated WA-45-1010, is water quality-impaired for the following parameters: in stream flow, pH, and temperature.

Surface Water Quality Criteria

Applicable criteria are defined in Chapter 173-201A WAC for aquatic biota. In addition, U.S. EPA has promulgated human health criteria for toxic pollutants (EPA 1992). Criteria for this discharge are summarized below:

Table 6: Applicable Water Quality Criteria

Parameter	Criterion
Fecal Coliforms	100 organisms/100 mL maximum geometric mean
Dissolved Oxygen	8 mg/L minimum
Temperature	18 degrees Celsius maximum or incremental increases above background
pH	6.5 to 8.5 standard units
Turbidity	less than 5 NTUs above background
Toxics	No toxics in toxic amounts (see Appendix C for numeric criteria for toxics of concern for this discharge)

CONSIDERATION OF SURFACE WATER QUALITY-BASED LIMITS FOR NUMERIC CRITERIA

Pollutant concentrations in the proposed discharge exceed water quality criteria with technology-based controls which the Department has determined to be AKART. A mixing zone is authorized in accordance with the geometric configuration, flow restriction, and other restrictions for mixing zones in Chapter 173-201A WAC.

These zones will accommodate the geometric configuration and flow restriction for mixing zones in Chapter 173-201A WAC and are defined as follows: "The chronic mixing zone shall extend downstream for three hundred (300) feet and upstream for one hundred (100) feet and shall extend thirty (30) feet across the river. The acute mixing zone shall extend downstream for thirty (30) feet and ten (10) feet upstream and shall extend three (3) feet across the river.

The dilution factors of effluent to receiving water that occur within these zones have been determined at the critical condition by the use of the Department's RIVPLUM.xls spreadsheet and were compared with analysis by CORMIX for a single port diffuser. While RIVPLUM determines a slightly more restrictive acute dilution factor than CORMIX at 10:1 vs. 12.5:1 respectively, the CORMIX chronic dilution factor is more restrictive than RIVPLUM at 37:1 vs. 47:1 respectively. The RIVPLUM model does not allow for outfalls other than sidebank and

submerged discharges. The CORMIX model models on the actual spatial design of the outfall and in the writer's opinion is more representative of actual conditions. The CORMIX dilution factors have been determined to be (from Appendix C):

Table 7: Applicable Dilution Factors

Mixing Zone Type	Acute	Chronic
Aquatic Life	12.5	37.1

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near field) or at a considerable distance from the point of discharge (far field). Toxic pollutants, for example, are near-field pollutants--their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as BOD is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

The derivation of water quality-based limits also takes into account the variability of the pollutant concentrations in both the effluent and the receiving water.

Temperature-- WAC 173-201A-030(2-i) Class A establishes a special temperature criteria of 18.0°C for this segment of the Wenatchee River and details 2 tests to demonstrate compliance. The regulation states: When natural conditions exceed 18.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed $t = 28/(T+7)$. The point of compliance for temperature is at the edge of the chronic mixing zone.

The impact of the discharge on the temperature of the receiving water was modeled by simple mixing analysis at critical condition. The receiving water temperature at critical condition is 15.7 ºC and the maximum effluent temperature is 25 ºC. The predicted resultant temperature at the boundary of the chronic mixing zone with a dilution factor of **37.1: 1** is 15.951 ºC. The incremental rise is 0.251 ºC.

$$t = 28 / (15.7+7)$$
$$t = 1.23 > 0.251$$

When natural conditions exceed 18.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C. The predicted temperature rise at an ambient river temperature of 18°C is 0.189°C.

$$0.189°C < 0.3°C$$

Under critical conditions there is no predicted violation of the Water Quality Standards for Surface Waters. Therefore, no effluent limitation for temperature is placed in the proposed permit.

pH--Under critical conditions there is no predicted violation of the Water Quality Standards for Surface Waters. Therefore, the technology-based effluent limitations for pH are placed in the permit and temperature is not limited.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require NPDES permits to contain effluent limits for toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. This process occurs concurrently with the derivation of technology-based effluent limits. Facilities with technology-based effluent limits defined in regulation are not exempted from meeting the Water Quality Standards for Surface Waters or from having surface water quality-based effluent limits.

The toxic, ammonia, was determined to be present in the discharge. A reasonable potential analysis (See Appendix C) was conducted on this parameter to determine whether or not effluent limitations would be required in this permit.

The determination of the reasonable potential for ammonia to exceed the water quality criteria was evaluated with procedures given in EPA, 1991 (Appendix C) at the critical condition. The critical condition in this case occurs July through September. The parameters used in the critical condition modeling are as follows: acute dilution factor **12.5:1** , chronic dilution factor **37.1:1**, receiving water temperature 15.7^{o}C, receiving water alkalinity 18.5 (as mg $CaCO_3$/L).

The determination of reasonable potential using 0.01 mg/L ammonia for background and a maximum effluent concentration of 4 mg ammonia/L resulted in no reasonable potential to exceed the water quality criteria. Therefore, a limit for ammonia in the proposed permit will not be required.

TMDL Considerations

The pending TMDL for the Wenatchee River may also include wasteload allocations for phosphorus at some time during the proposed permit cycle. This is in response to high pH values found at the confluence of the Wenatchee and Columbia Rivers. Phosphorous is a known limiting factor in plant growth, which has a direct effect on pH in the water column. At this time it is unknown whether a wasteload allocation for phosphorus will be imposed at the Leavenworth location. In anticipation that a wasteload allocation will be imposed sometime during the proposed permit term Special Conditions, S1.A. 2a and 2b, provisionally requires the Permittee to meet a Schedule of Compliance for meeting an imposed wasteload allocation and to provide the Department with a Progress Report.

Whole Effluent Toxicity

The Water Quality Standards for Surface Waters require that the effluent not cause toxic effects in the receiving waters. Many toxic pollutants cannot be detected by commonly available detection methods. However, toxicity can be measured directly by exposing living organisms to the wastewater in laboratory tests and measuring the response of the organisms. Toxicity tests measure the aggregate toxicity of the whole effluent, and therefore this approach is called whole effluent toxicity (WET) testing.

The likelihood of toxics in toxic amounts in the effluent is extremely small given the absence of any industrial contributors and, therefore, Wet Testing will not be required in the proposed permit.

Human Health

Washington's water quality standards now include 91 numeric health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the State by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

The Department has determined that the applicant's discharge is unlikely to contain chemicals regulated for human health,

Sediment Quality

The Department has promulgated aquatic sediment standards (Chapter 173-204 WAC) to protect aquatic biota and human health. These standards state that the Department may require Permittees to evaluate the potential for the discharge to cause a violation of applicable standards (WAC 173-204-400).

The Department has determined through a review of the discharger characteristics and effluent characteristics that this discharge has no reasonable potential to violate the Sediment Management Standards.

GROUND WATER QUALITY LIMITATIONS

This Permittee has no discharge to ground; therefore, no limitations are required based on potential effects to ground water.

MONITORING REQUIREMENTS

Effluent monitoring, recording, and reporting are required (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and the effluent limitations are being achieved.

The monitoring and testing schedule is detailed in this permit under Special Condition S2. Specified monitoring frequencies take into account the quantity and variability of discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. Monitoring frequencies for BOD, TSS and fecal coliforms, twice per week, are consistent with those found in the Department's *Permit Writer's Manual*. However, the Permittee may request, by formal letter, that monitoring frequencies be reduced. See Special Condition S2. E. for details on the request procedure.

In light of the pending TMDL for phosphorous the Permittee will be required to monitor the effluent for total phosphorous monthly. In addition, the City is currently under order to monitor their influent for FOG. The proposed permit will require this monitoring through the permit term

LAB ACCREDITATION

With the exception of certain parameters the permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories.* The laboratory at this facility is accredited for general chemistry and microbiology.

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The provisions of Special Condition S3. are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-220-210).

PREVENTION OF FACILITY OVERLOADING

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require the Permittee to take the actions detailed in Special Condition S4. to plan expansions or modifications before existing capacity is reached and to report and correct conditions that could result in new or increased discharges of pollutants. Special Condition S4. restricts the amount of flow.

Special Condition S4.D requires submittal of two Infiltration and Inflow (I/I) Evaluations, the first is due on July 31, 2007 and the second one with the application for permit renewal. The approved *Facilities Plan* identified collection system deficiencies that result in intermittent, but potentially serious I/I problems (pp. III-1 to III-6). The evaluations will help to document the City's progress in correcting these deficiencies.

Special Condition S4.E requires two (2) Wasteload Assessments be submitted to the Department during the permit cycle. The usual annual reporting cycle for the assessment was modified because the wasteload is expected to remain relatively constant during the permit cycle, although it may gradually increase as additional residential and commercial properties are connected to the system.

OPERATION AND MAINTENANCE (O&M)

The proposed permit contains Special Condition S5. as authorized under RCW 90.48.110, WAC 173-220-150, Chapter 173-230 WAC, and WAC 173-240-080. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment.

RESIDUAL SOLIDS HANDLING

To prevent water quality problems the Permittee is required in Special Condition S7. to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and State Water Quality Standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under Chapter 70.95J RCW and Chapter 173-308 WAC. The disposal of other solid waste is under the jurisdiction of the Chelan County Health Department.

WASTEWATER PERMIT REQUIRED

RCW 90.48 and WAC 173-216-040 require SIUs to obtain a permit prior to discharge of industrial waste to the Permittee's sewerage system. This provision prohibits the POTW from accepting industrial wastewater from any such dischargers without authorization from the Department.

DUTY TO ENFORCE DISCHARGE PROHIBITIONS

This provision prohibits the POTW from authorizing or permitting an industrial discharger to discharge certain types of waste into the sanitary sewer. The first portion of the provision prohibits acceptance of pollutants which cause pass through or interference. The definitions of pass through and interference are in Appendix B of the fact sheet.

The second portion of this provision prohibits the POTW from accepting certain specific types of wastes, namely those which are explosive, flammable, excessively acidic, basic, otherwise corrosive, or obstructive to the system. In addition wastes with excessive BOD, petroleum based oils, or which results in toxic gases are prohibited to be discharged. The regulatory basis for these prohibitions is 40 CFR Part 403, with the exception of the pH provisions which are based on WAC 173-216-060.

The third portion of this provision prohibits certain types of discharges unless the POTW receives prior authorization from the Department. The discharges include cooling water in significant volumes, stormwater and other direct inflow sources, and wastewaters significantly affecting system hydraulic loading, which do not require treatment.

SUPPORT BY THE DEPARTMENT FOR DEVELOPING PARTIAL PRETREATMENT PROGRAM BY POTW

The Department has committed to providing technical and legal assistance to the Permittee in fulfilling these joint obligations, in particular assistance with developing an adequate sewer use ordinance, notification procedures, enforcement guidelines, and developing local limits and inspection procedures.

SPILL PLAN

The Department has determined that the Permittee stores a quantity of chemicals that have the potential to cause water pollution if accidentally released. The Department has the authority to require the Permittee to develop best management plans to prevent this accidental release under section 402(a)(1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080.

The proposed permit requires the Permittee to develop and implement a plan for preventing the accidental release of pollutants to State waters and for minimizing damages if such a spill occurs.

The Permittee has developed a plan for preventing the accidental release of pollutants to State waters and for minimizing damages if such a spill occurs. The proposed permit requires the Permittee to update this plan and submit it to the Department.

FOG ELIMINATION IMPLEMENTATION REPORT

In accordance with Consent Order # DE 03WQCR-5581 issued December 30, 2003, the Permittee is required to submit to the Department one fog elimination implementation report in the proposed permit term. One report for the calendar year ending on January 15, 2005 is due on or before February 15, 2005 which falls within the current permit term and the final one for the calendar year 2005 ending January 15, 2006 is due during the proposed permit term on or before February 15, 2006.

GENERAL CONDITIONS

General Conditions are based directly on State and Federal law and regulations and have been standardized for all individual municipal NPDES permits issued by the Department.

PERMIT ISSUANCE PROCEDURES

PERMIT MODIFICATIONS

The Department may modify this permit to impose numerical limitations, if necessary to meet Water Quality Standards, Sediment Quality Standards, or Ground Water Standards, based on new information obtained from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

The Department may also modify this permit as a result of new or amended State or Federal regulations.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to protect human health, aquatic life, and the beneficial uses of waters of the State of Washington. The Department proposes that this permit be issued for five (5) years.

REFERENCES FOR TEXT AND APPENDICES

Environmental Protection Agency (EPA)

1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001.

1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington, D.C.

1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. EPA/600/6-85/002a.

1983. Water Quality Standards Handbook. USEPA Office of Water, Washington, D.C.

Metcalf and Eddy.

1991. Wastewater Engineering, Treatment, Disposal, and Reuse. Third Edition.

Tsivoglou, E.C., and J.R. Wallace.

1972. Characterization of Stream Reaeration Capacity. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

Laws and Regulations(http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information (http://www.ecy.wa.gov/programs/wq/wastewater/index.html

Washington State Department of Ecology.

1994. Permit Writer's Manual. Publication Number 92-109

Water Pollution Control Federation.

1976. Chlorination of Wastewater.

Wright, R.M., and A.J. McDonnell.

1979. In-stream Deoxygenation Rate Prediction. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

APPENDIX A -- PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to reissue a permit to the applicant listed on page 1 of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

Public notice of application was published on July 15, 2004 in the Wenatchee World to inform the public that an application had been submitted and to invite comment on the reissuance of this permit.

The Department will publish a Public Notice of Draft (PNOD) on February 9, 2005 in the Leavenworth Echo/Cashmere Valley Record to inform the public that a draft permit and fact sheet are available for review. Interested persons are invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents are available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments should be mailed to:

Water Quality Permit Coordinator
Department of Ecology
Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the thirty (30) day comment period to the address above. The request for a hearing shall indicate the interest of the party and the reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-220-090). Public notice regarding any hearing will be circulated at least thirty (30) days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing (WAC 173-220-100).

Comments should reference specific text followed by proposed modification or concern when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility's proposed coverage, adequacy of environmental protection, permit conditions, or any other concern that would result from issuance of this permit.

The Department will consider all comments received within thirty (30) days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, 509/457-7105, or by writing to the address listed above.

This permit and fact sheet were written by Richard Marcley.

APPENDIX B -- GLOSSARY

Acute Toxicity--The lethal effect of a pollutant on an organism that occurs within a short period of time, usually 48 to 96 hours.

AKART-- An acronym for "all known, available, and reasonable methods of prevention, control, and treatment".

Ambient Water Quality--The existing environmental condition of the water in a receiving water body.

Ammonia--Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Average Monthly Discharge Limitation --The highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month (except in the case of fecal coliform). The daily discharge is calculated as the average measurement of the pollutant over the day.

Average Weekly Discharge Limitation -- The highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week. The daily discharge is calculated as the average measurement of the pollutant over the day.

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the Federal Clean Water Act.

Bypass--The intentional diversion of waste streams from any portion of a treatment facility.

CBOD5 – The quantity of oxygen utilized by a mixed population of microorganisms acting on the nutrients in the sample in an aerobic oxidation for five days at a controlled temperature of 20 degrees Celsius, with an inhibitory agent added to prevent the oxidation of nitrogen compounds. The method for determining CBOD5 is given in 40 CFR Part 136.

Chlorine--Chlorine is used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic Toxicity--The effect of a pollutant on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean Water Act (CWA)--The Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Combined Sewer Overflow (CSO)--The event during which excess combined sewage flow caused by inflow is discharged from a combined sewer, rather than conveyed to the sewage treatment plant because either the capacity of the treatment plant or the combined sewer is exceeded.

Compliance Inspection - Without Sampling--A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling--A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the percent removal requirement. Additional sampling may be conducted.

Composite Sample--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing a minimum of four discrete samples. May be "time-composite"(collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction Activity--Clearing, grading, excavation and any other activity which disturbs the surface of the land. Such activities may include road building, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Continuous Monitoring –Uninterrupted, unless otherwise noted in the permit.

Critical Condition--The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Dilution Factor--A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the effluent fraction e.g., a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Engineering Report--A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal Coliform Bacteria--Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab Sample--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial User-- A discharger of wastewater to the sanitary sewer which is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial Wastewater--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Infiltration and Inflow (I/I)--"Infiltration" means the addition of ground water into a sewer through joints, the sewer pipe material, cracks, and other defects. "Inflow" means the addition of precipitation-caused drainage from roof drains, yard drains, basement drains, street catch basins, etc., into a sewer.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal and;

Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Major Facility--A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum Daily Discharge Limitation--The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

Minor Facility--A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing Zone--A volume that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in State regulations (Chapter 173-201A WAC).

National Pollutant Discharge Elimination System (NPDES)--The NPDES (Section 402 of the Clean Water Act) is the Federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the State of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both State and Federal laws.

Pass through -- A discharge which exits the POTW into waters of the-State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

pH--The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Potential Significant Industrial User--A potential significant industrial user is defined as an Industrial User which does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

The Department may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation Level (QL)-- A calculated value five times the MDL (method detection level).

Significant Industrial User (SIU)--

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;
2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

   Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

State Waters--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, wetlands, and all other surface waters and watercourses within the jurisdiction of the State of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Suspended Solids (TSS)--Total suspended solids are the particulate materials in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset--An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water Quality-based Effluent Limit--A limit on the concentration or mass of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into a receiving water.

APPENDIX C -- TECHNICAL CALCULATIONS

RIVPLUM Dilution Factor Model

Revised 22-Feb-96

INPUT	Acute Max Day Value	Chronic Max Month Value
1. Effluent Discharge Rate (cfs):	1.98	1.30
2. Receiving Water Characteristics Downstream From Waste Input		
Stream Depth (ft):	3.00	3.00
Stream Velocity (fps):	1.30	1.30
Channel Width (ft):	150.00	150.00
Stream Slope (ft/ft) or Manning roughness "n":	0.045	0.045
0 if slope or 1 if Manning "n" in previous cell:	1	1
3. Discharge Distance From Nearest Shoreline (ft):	0	0
4. Location of Point of Interest to Estimate Dilution		
Distance Downstream to Point of Interest (ft):	30	300
Distance From Nearest Shoreline (ft):	0	0
5. Transverse Mixing Coefficient Constant (usually 0.6):	0.6	0.6
6. Original Fischer Method (enter 0) or *Effective Origin* Modification (enter 1)	0	0
OUTPUT		
Unbounded Plume Width at Point of Interest (ft)	15.703	49.658
Unbounded Plume half-width (ft)	7.852	24.829
Distance from near shore to discharge point (ft)	0.00	0.00
Distance from far shore to discharge point (ft)	150.00	150.00
Plume width bounded by shoreline (ft)	7.85	24.83
Approximate Downstream Distance to Complete Mix (ft):	35,038	35,038
Theoretical Dilution Factor at Complete Mix:	294.859	450.000
Calculated Flux-Average Dilution Factor Across Entire Plume Width:	15.434	74.487
Calculated Dilution Factor at Point of Interest:	**9.672**	**46.678**

ACUTE DILUTION FACTOR

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX:
                       CORMIX MIXING ZONE EXPERT SYSTEM
                           CORMIX-GI Version 4.2GT
                        HYDRO1:Version-4.2  August,2002
SITE NAME/LABEL:
  DESIGN CASE:
  FILE NAME:                      UNSET.prd
Using subsystem CORMIX1:          Submerged Single Port Discharges
  Start of session:               12/03/2004--16:46:26
*****************************************************************
SUMMARY OF INPUT DATA:
-----------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                           = bounded
  Width                            BS     = 45.72 m
  Channel regularity               ICHREG = 1
  Ambient flowrate                 QA     = 10.73 m^3/s
  Average depth                    HA     = 0.91 m
  Depth at discharge               HD     = 0.91 m
  Ambient velocity                 UA     = 0.2567 m/s
  Darcy-Weisbach friction factor   F      = 0.1637
    Calculated from Manning's n           = 0.045
  Wind velocity                    UW     = 1 m/s
Stratification Type                STRCND = U
  Surface temperature                     = 15.70
 degC
  Bottom temperature                      = 15.70 degC
  Calculated FRESH-WATER DENSITY values:
  Surface density                  RHOAS  = 998.9926 kg/m^3
  Bottom density                   RHOAB  = 998.9926 kg/m^3

DISCHARGE PARAMETERS:              Submerged Single Port Discharge
  Nearest bank                           = left
  Distance to bank                 DISTB  = 21.03 m
  Port diameter                    DO     = 0.3048 m
  Port cross-sectional area        AO     = 0.0730 m^2
  Discharge velocity               UO     = 0.77 m/s
  Discharge flowrate               QO     = 0.056181 m^3/s
  Discharge port height            HO     = 0.15 m
  Vertical discharge angle         THETA  = 15 deg
  Horizontal discharge angle       SIGMA  = 90 deg
  Discharge temperature (freshwater)      = 17 degC
    Corresponding density          RHOO   = 998.7761 kg/m^3
  Density difference               DRHO   = 0.2164 kg/m^3
  Buoyant acceleration             GPO    = 0.0021 m/s^2
  Discharge concentration          CO     = 0.0001 mg/l
  Surface heat exchange coeff.     KS     = 0 m/s
  Coefficient of decay             KD     = 0 /s

********************** REGULATORY MIXING ZONE SUMMARY ********************
The plume conditions at the boundary of the specified RMZ are as follows:
  Pollutant concentration                  = 0.000008  mg/l
Corresponding dilution                     = 12.5
  Plume location:                        x = 9.24 m
    (centerline coordinates)             y = 3.16 m
                                         z = 0.91 m
  Plume dimensions:                half-width = 1.49 m
                                    thickness = 0.91 m
```

CHRONIC DILUTION FACTOR

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX)
                        CORMIX MIXING ZONE EXPERT SYSTEM
                            CORMIX-GI Version 4.2GT
                         HYDRO1:Version-4.2  August,2002
SITE NAME/LABEL:
  DESIGN CASE:
  FILE NAME:                      UNSET.prd
Using subsystem CORMIX1:          Submerged Single Port Discharges
  Start of session:               12/03/2004--17:06:10
*****************************************************************
SUMMARY OF INPUT DATA:
-----------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                           = bounded
  Width                           BS      = 45.72 m
  Channel regularity              ICHREG  = 1
  Ambient flowrate                QA      = 10.73 m^3/s
  Average depth                   HA      = 0.91 m
  Depth at discharge              HD      = 0.91 m
  Ambient velocity                UA      = 0.2567 m/s
  Darcy-Weisbach friction factor  F       = 0.1637
    Calculated from Manning's n           = 0.045
  Wind velocity                   UW      = 1 m/s
Stratification Type               STRCND  = U
  Surface temperature                     = 15.70
 degC
  Bottom temperature                      = 15.70 degC
  Calculated FRESH-WATER DENSITY values:
  Surface density                 RHOAS   = 998.9926 kg/m^3
  Bottom density                  RHOAB   = 998.9926 kg/m^3

DISCHARGE PARAMETERS:             Submerged Single Port Discharge
  Nearest bank                            = left
  Distance to bank                DISTB   = 21.03 m
  Port diameter                   DO      = 0.3048 m
  Port cross-sectional area       AO      = 0.0730 m^2
  Discharge velocity              UO      = 0.50 m/s
  Discharge flowrate              QO      = 0.036812 m^3/s
  Discharge port height           HO      = 0.15 m
  Vertical discharge angle        THETA   = 15 deg
  Horizontal discharge angle      SIGMA   = 90 deg
  Discharge temperature (freshwater)      = 17 degC
    Corresponding density         RHOO    = 998.7761 kg/m^3
  Density difference              DRHO    = 0.2164 kg/m^3
  Buoyant acceleration            GPO     = 0.0021 m/s^2
  Discharge concentration         CO      = 0.0001 mg/l
  Surface heat exchange coeff.    KS      = 0 m/s
  Coefficient of decay            KD      = 0 /s
********************** REGULATORY MIXING ZONE SUMMARY ********************
The plume conditions at the boundary of the specified RMZ are as follows:
  Pollutant concentration                 = 0.000003  mg/l
Corresponding dilution                    = 37.1
  Plume location:                       x = 91.44 m
    (centerline coordinates)            y = 3.05 m
                                        z = 0.91 m
  Plume dimensions:              half-width = 2.90 m
                                  thickness = 0.91 m
```

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found on the Department's homepage at (http://www.ecy.wa.gov/programs/wq/wastewater/index.html

Freshwater un-ionized ammonia criteria based on EPA Gold Book (EPA 440/5-86-001) as revised by Heber and Ballentine (1992). Based on Lotus File NH3FRES2.WK1 Revised 12-Dec-94

INPUT	
1. Temperature (deg C; 0<T<30):	15.7
2. pH (6.5<pH<9.0):	7.40
3. Total Ammonia (ug N/L):	10.0
4. Acute TCAP (Salmonids present- 20; absent- 25):	20
5. Chronic TCAP (Salmonids present- 15; absent- 20):	15

OUTPUT

1. Intermediate Calculations:

Acute FT:	1.3459
Chronic FT:	1.4125
FPH:	1.6000
RATIO:	20.2020
pKa:	9.5395
Fraction Of Total Ammonia Present As Un-ionized:	0.7200%

2. Sample Un-ionized Ammonia Concentration (ug/L as NH3-N): 0.1

3. Un-ionized Ammonia Criteria:

Acute (1-hour) Un-ionized Ammonia Criterion (ug/L as NH3-N):	99.2
Chronic (4-day) Un-ionized Ammonia Criterion (ug/L as NH3-N):	14.4

4. Total Ammonia Criteria:

Acute Total Ammonia Criterion (ug/L as NH3-N):	**13,785**
Chronic Total Ammonia Criterion (ug/L as NH3-N):	**2,000**

Calculation of pH of a mixture of two flows. Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

INPUT	
1. DILUTION FACTOR AT MIXING ZONE BOUNDARY	12.500
1. UPSTREAM/BACKGROUND CHARACTERISTICS	
Temperature (deg C):	15.70
pH:	7.40
Alkalinity (mg CaCO3/L):	18.50
2. EFFLUENT CHARACTERISTICS	
Temperature (deg C):	25.00
pH:	9.00
Alkalinity (mg CaCO3/L):	29.10

OUTPUT	
1. IONIZATION CONSTANTS	
Upstream/Background pKa:	6.41
Effluent pKa:	6.35
2. IONIZATION FRACTIONS	
Upstream/Background Ionization Fraction:	0.91
Effluent Ionization Fraction:	1.00
3. TOTAL INORGANIC CARBON	
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	20.41
Effluent Total Inorganic Carbon (mg CaCO3/L):	29.17
4. CONDITIONS AT MIXING ZONE BOUNDARY	
Temperature (deg C):	16.44
Alkalinity (mg CaCO3/L):	19.35
Total Inorganic Carbon (mg CaCO3/L):	21.11
pKa:	6.41
pH at Mixing Zone Boundary:	**7.45**

Reasonable Potential Calculations

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G

				Reasonable Potential		**Calculations**		
				State Water Quality Standard		Max concentration at edge of...		
				Acute	Chronic	Acute Mixing Zone	Chronic Mixing Zone	**LIMIT REQ'D?**
Parameter				*ug/L*	*ug/L*	*ug/L*	*ug/L*	
Ammonia				13785	2000	1886.1	636.8	**NO**
Effluent percentile value		Max effluent conc. measured (metals as total recoverable)	Coeff Variation		# of samp	Multiplier	**Acute Dil'n Factor**	**Chronic Dil'n Factor**
	Pn	ug/L	CV	s	n			
0.95	0.926	4000.00	0.60	0.55	39	1.12	**12.5**	**37.1**

Spreadsheet prepared by G.Shervey, WA Dept. of Ecology, NW Regional Office on 2-5-93.
Last revised 4-25-95 by G Shervey.

	Temperature Mass Balance Model				
CHRONIC DILUTION					
dil valuator	effluent temp	dil valuator	ambient temp	**final temp**	**dil factor**
0.701	25	25.31	18	18.189	37.1
			Predicted Increase		**No limit required**
Temperature Increase Limit 0.3			**0.189 °C**		

	Temperature Mass Balance Model				
CHRONIC DILUTION					
dil valuator	effluent temp	dil valuator	ambient temp	**final temp**	**dil factor**
0.701	25	25.31	15.7	15.951	37.11
Temperature Increase Limit t=28/(15.7+7) = 1.23			**Predicted Increase**		**No limit required**
			0.251 °C		

APPENDIX D -- RESPONSE TO COMMENTS

No comments were received by the Department of Ecology.